Indicator: Population Served by Community Water Systems with No Reported Violations of Health-Based Standards (049)

Community Water Systems (CWS), public water systems that supply water to the same population year-round, served over 272 million Americans in 2004 (EPA 2005), just over 92 percent of the U.S. population (Census Bureau 2005). This indicator presents the percentage of Americans served by CWS with no reported violations of EPA health-based standards for over 90 contaminants (EPA 2004).

Health-based standards include Maximum Contaminant Levels (MCLs) and Treatment Techniques (TTs). An MCL is the highest level of a contaminant that is allowed in the finished (i.e., treated) water. A TT is a required treatment process (such as filtration or disinfection) intended to prevent the occurrence of a contaminant in treated tap water (EPA, 2004). TTs are adopted where it is not economically or technologically feasible to ascertain the level of a contaminant, as microbes which may be virulent as single organisms but are rarely present at a constant dilution. Compliance with TTs may require finished water sampling for such contaminants, along with quantitative or descriptive measurements of process performance, to gauge the efficacy of the treatment process. Because occurrence levels of MCL-regulated contaminants tend to have long-term rather than acute health effects, and vary by time of year if at all (e.g., levels of naturally-occurring chemical or radiological contaminants in ground water are relatively constant), compliance is based on averages of seasonal, annual, or less frequent sampling.

This indicator presents the total population nationally and by EPA region that is served by CWS for which no violations were reported to EPA for the period 1993-2004. It also presents the subset of that population that is served by community water systems in Indian Country in FY 2004. The indicator also presents data on the number of persons served by systems with reported violations of standards covering microbial contaminants (microorganisms that can cause disease) and disinfection byproducts (chemicals that may pose health risks and that may form when disinfectants, such as chlorine, react with naturally occurring materials in water) (EPA, 2004). The indicator is based on violations data reported quarterly by the States, EPA, and the Navajo Nation Indian Tribe, who each review monitoring results for the CWS which they oversee.

What the Data Show

The percentage of the population served by systems for which no health-based violations were reported for the entire year increased from 79% in 1993 to 94% in 2002 before declining to 90% in 2004, the latest year for which data are available (Fig. 049-1). The percentage of population served by Community Water Systems (CWS) with no reported violations of standards in 2004 was 92% or greater in seven of the ten Regions (Figure 049-2). Between 1993 and 2002, the percentage of the population served by systems with no reported violations consistently exceeded the 90% national average in six of the EPA Regions, and three more have been slightly below 90% in one of the past two years. Only one Region has been consistently below the national average since 1993, largely because of the long time-frame involved in planning and building one city's drinking water filtration plant.

In 2004, reported violations of health-based standards affecting the largest populations (Figure 049-3) involved the original and Interim Enhanced SurfaceWater Treatment Rules in systems serving over 12 million people (7.7% of the population served by surface water systems nationally), the Total Coliform Rule in systems serving 10.6 million people (4.8% of the population served nationally), and the Disinfection Byproducts Stage 1 rule, in systems serving nearly 7.4 million people (2.7% of the population served nationally). Together, 90% of the population served by systems that reported a violation in 2004~~,~~ involved these rules governing treatment to prevent waterborne diseases – the most

widespread and acute threat to health from drinking water – or the contaminants created by such treatment.

The patterns in Indian Country were similar to those in the Regions, with the percentage of population served by CWS for which no violations of standards were reported being 93 percent or greater in seven out of the nine Regions (Region 3 has no federally-recognized Tribes)(Figure 049-4). Of the three with a lower percentage of population served by systems with no reported violation, Region 5 (82%) and the Navajo Nation (89%) involved only a handful of CWS in violation. Region 9 Tribes had the largest total population served by those systems for which a violation was reported.

Indicator Limitations

- This indicator does not present data for the population served by non-community water systems; these are typically relatively small systems that serve only transient populations (such as restaurants or campgrounds) or occasional local users (such as schools or office buildings).
- It does not cover domestic (home) use of drinking water supplied by private wells for about 43.5 million people (approximately 15% of the U.S. population, many of whom may, however, receive water from a CWS at their workplace or school) (USGS, 2004), which wells are not regulated unless they serve multiple households and states choose to oversee them.
- The indicator does not include bottled water, which is regulated by standards set by the Food and Drug Administration using EPA's levels.
- National data based on population served by systems can be volatile (a single very large system can sway the results by up to 2.3%). This effect becomes more pronounced when the results are broken down at the regional level, and still more so in results for a single rule.
- Data may overstate the extent of population receiving water that violates standards, because the entire population served by each system in violation is reported, while in many cases only a portion of the total population by a system in violation actually receives water that is out of compliance. Data stated on an annual basis may suggest a longer duration of violations than may be the case, as some may be as brief as an hour or a day. Data may understate the population receiving water that violates standards, because CWS that purchase water from other CWS are not always required to sample for all contaminants themselves, and CWS wholesaling water generally do not report the water quality for the population served by those other systems in the violations data.
- Under-reporting and late reporting of water system violations data by states to EPA affect the ability to accurately report the quality of our nation's drinking water. EPA last quantified the quality of violations data in 2004 for the period 1999 to 2001. Based on this analysis, EPA estimated that states were not reporting 35 percent of all health-based violations to EPA (which reflects a sharp improvement in the quality of violations data compared to the previous three-year period). EPA is continuing to verify state-reported water system data and expects to issue an updated estimate of data quality in 2006 for the period 2002-2004.
- State data verification and other quality assurance analyses indicate that the most significant data quality problem is under-reporting of monitoring and health-based violations and inventory characteristics. The most significant under-reporting occurs in monitoring violations. Even though those are separate from the health-based violations covered by the indicator, failures to monitor could mask treatment technique and MCL violations. Such under-reporting of violations limits EPA's ability to quantify accurately the number of people affected by health-based violations.

Data Sources

The underlying database for this indicator is EPA's Safe Drinking Water Information System/Federal version.
http://www.epa.gov/safewater/data/pdfs/factoids_2003.pdf [NOTE: the FY2004 factoids have been provided for this indicator, but are not yet posted online]

http://www.epa.gov/safewater/data/getdata.html

References

FY2004 factoids, currently unpublished (see data source below). Expected to be posted anytime.

EPA June 2004 Safe Drinking Water Act 30th Anniversary Fact Sheet: Drinking Water Monitoring, Compliance, and Enforcement.
http://www.epa.gov/safewater/sdwa/30th/factsheets/monitoring_compliance.html

EPA June 2004. Safe Drinking Water Act 30th Anniversary Fact Sheet: Drinking Water Standards and Health Effects.
http://www.epa.gov/safewater/sdwa/30th/factsheets/standard.html

EPA June 2004. Safe Drinking Water Act 30th Anniversary Fact Sheet: Glossary.
http://www.epa.gov/safewater/sdwa/30th/factsheets/glossary.html

U.S. Census Bureau 2005. Monthly National Population Estimates.
http://www.census.gov/popest/national/NA-EST2004-01.html
U.S. Geological Survey 2004 revision. Estimated Use of Water in the United States in 2000.
http://water.usgs.gov/pubs/circ/2004/circ1268/

Graphics

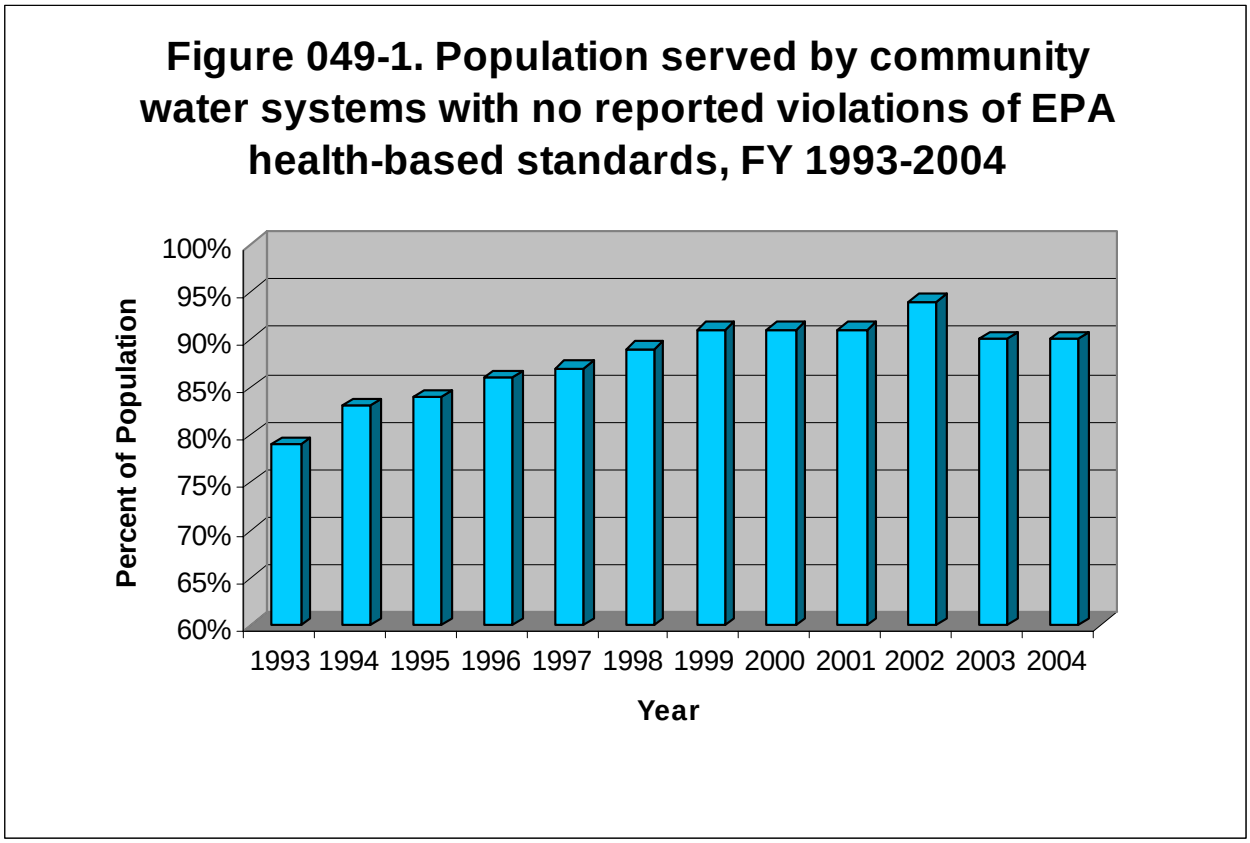
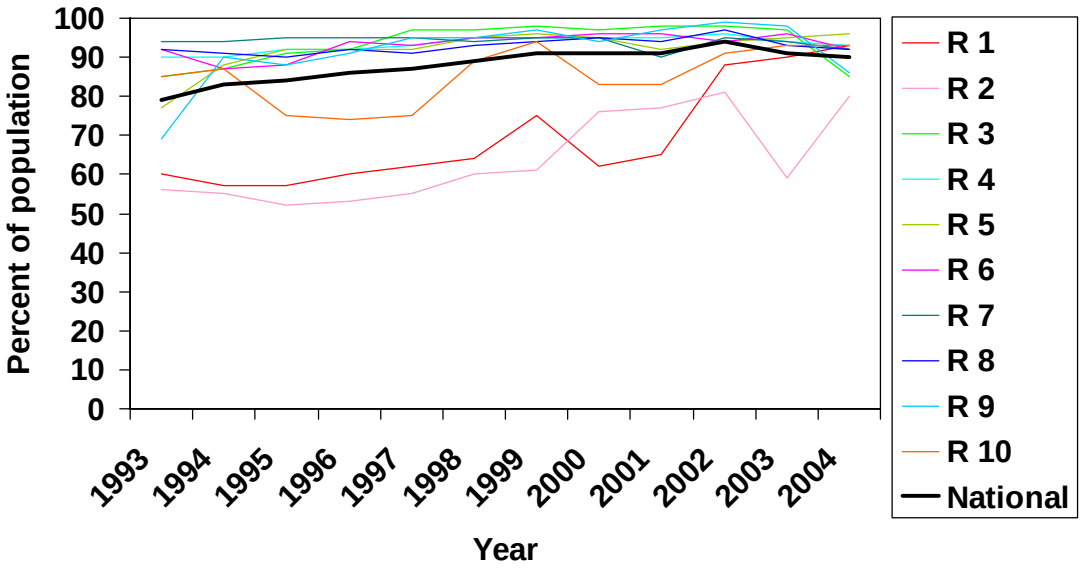


Figure 049-1. Population served by community water systems with no reported violations of EPA health-based standards, FY 1993-2004
Percent of Population
100%
95%
90%
85%
80%
75%
70%
65%
60%
1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004
Year

Figure 049-2. Population served by community water systems with no reported violations of EPA health-based standards, by EPA Region



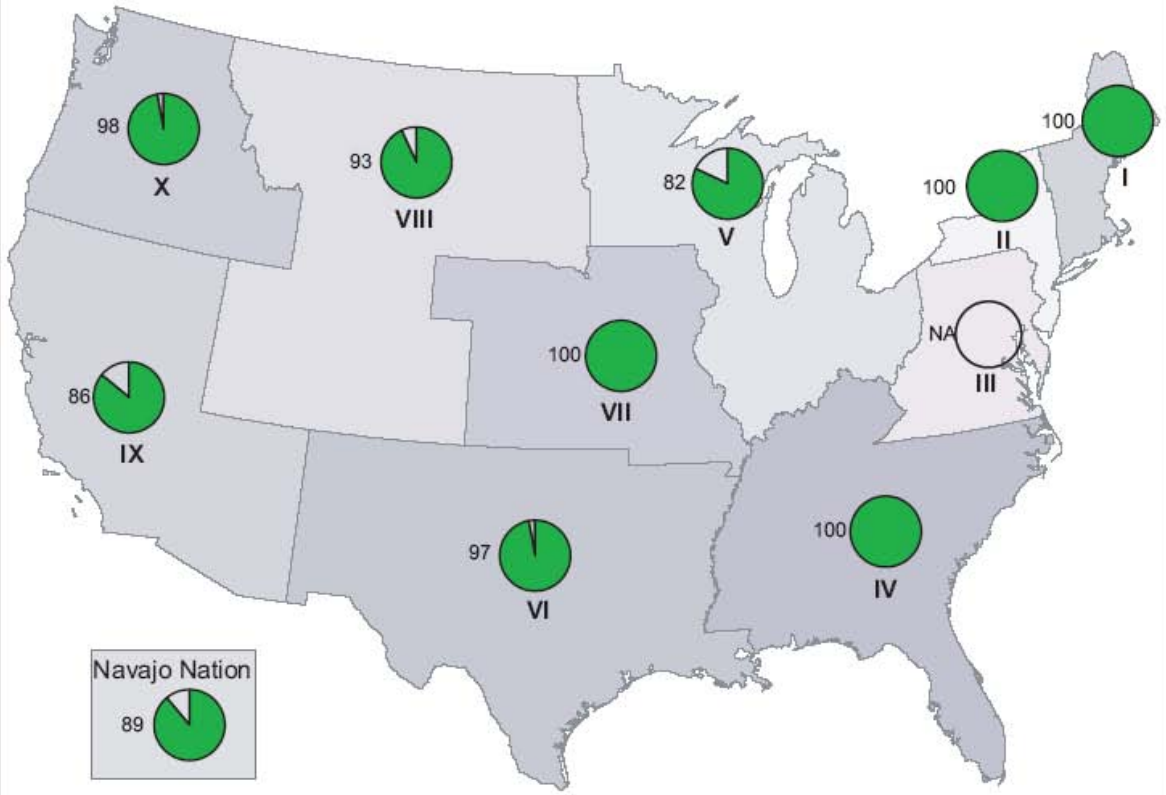
Source: US Environmental Protection Agency, Safe Drinking Water Information System, Federal Version, 2004.

Figure 049-3. Type of reported violations of EPA health-based standards for CWS in FY 2004

Type of violations	Population Served	% of the total population reporting any type of violation	% of the total population served by CWS
Total Coliform, Disinfection By Products, or Surface Water Treatment Rules	24,667,978	90	9
Any type of violation	27,285,178	100	10

Source: US Environmental Protection Agency, Safe Drinking Water Information System, Federal Version. 2004.

Figure 049-4. Percent of Population Served by CWS in Indian Country with No Reported Violations of EPA Health-Based Drinking Water Standards in 2004, by EPA Region



Indian country includes all lands within Indian reservations, all dependent Indian communities, and Indian allotments. EPA Region III has no federally recognized Indian Tribes.
CWS = Community Water Systems

Source: U.S. Environmental Protection Agency, Safe Drinking Water Information System, Federal Version, 2004.

R.O.E. Indicator QA/QC

Data Set Name: POPULATION SERVED BY COMMUNITY WATER SYSTEMS WITH NO REPORTED HEALTH-BASED VIOLATIONS
Indicator Number: 049 (89142)
Data Set Source: EPA Safe Drinking Water Information System/Federal (SDWIS/FEC)
Data Collection Date: Ongoing: 1993 - present
Data Collection Frequency: Indicator calculated annually on fiscal year basis
Data Set Description: Population served by community water systems with no reported violation of federal health-based drinking water standards.
Primary ROE Question: What are the trends in the quality of finished drinking water?

Question/Response

T1Q1 Are the physical, chemical, or biological measurements upon which this indicator is based widely accepted as scientifically and technically valid?

Yes. Based on regulations under the Safe Drinking Water Act, all public water systems (PWS) are required to report monitoring results to States. States determine violations of maximum contaminant levels (MCL) and treatment techniques (TT) and are required to report all violations of Federal health-based drinking water regulations to EPA. The underlying data were developed using consistent analytical methods specified in regulation.

T1Q2 Is the sampling design and/or monitoring plan used to collect the data over time and space based on sound scientific principles?

Yes. There is uniform national coverage for this indicator. The underlying data were developed using consistent analytical methods, sampling locations and monitoring frequencies specified in regulation. They result from laboratory analysis following Quality Assurance plans. The data are reviewed by the PWS and then are reviewed by the State. States make determinations of whether violations occurred and report those determinations to EPA. MCLs are health-based standards for drinking water quality. The indicator represents aggregated data and is not based on a model. Sometimes data are not reported within the timeframe specified by regulations.

T1Q3 Is the conceptual model used to transform these measurements into an indicator widely accepted as a scientifically sound representation of the phenomenon it indicates?

Yes. The indicator is based on a simple calculation that subtracts the population served by systems which have reported violations in a particular year from the total population served by community water systems, and divides the difference by the total population served by all systems.

T2Q1 To what extent is the indicator sampling design and monitoring plan appropriate for answering the relevant question in the ROE?

There are approximately 54,000 community water systems in the U.S., each of which is required to monitor and report violations according to QA plans which are based in regulation. CWS' routinely monitor and report on whether their systems are meeting standards for over 90 contaminants.

T2Q2 To what extent does the sampling design represent sensitive populations or ecosystems?

The indicator reports the entire population served by a CWS with a reported violation of a federal health-based drinking water standard. Federal drinking water standards are set to protect the most vulnerable populations.

T2Q3 Are there established reference points, thresholds or ranges of values for this indicator that unambiguously reflect the state of the environment?

Yes. MCLs and TTs are federal health-based standards for drinking water quality, arrived at only after scientific review, an extensive public comment period, and in some cases regulatory negotiation with stakeholders.

T3Q1 What documentation clearly and completely describes the underlying sampling and analytical procedures used?

For sampling and analytical requirements as listed in National Primary Drinking Water Regulations (http://www.access.gpo.gov/nara/cfr/waisidx_02/40cfr141_02.html). For analytical methods (listed by contaminant and by method number and source): http://www.epa.gov/safewater/methods/methods.html.

T3Q2 Is the complete data set accessible, including metadata, data-dictionaries and embedded definitions or are there confidentiality issues that may limit accessibility to the complete data set?

Yes. http://www.epa.gov/safewater/data/getdata.html is the principal means to access SDWIS/FED data. http://www.epa.gov/safewater/sdwisfed/sdwis.htm contains numerous materials including technical and software documentation, data dictionary, fact sheets, and related documents describing, characterizing, and providing partial access to the SDWIS/FED database. The EPA website Envirofacts (http://www.epa.gov/enviro/html/sdwis/sdwis_query.html) makes a sub-set of SDWIS/FED information easily available to anyone with access to the Internet. The fact sheet entitled "Information Available From the Safe Drinking Water Information System" (http://www.epa.gov/safewater/sdwisfed/sfed2.html) provides more detailed information on the types of data that are available from SDWIS/FED. SDWIS/FED drinking water information that is not on the Internet is available to the public under the Freedom of Information Act (FOIA), except for well and intake location data which have been determined to be homeland security-sensitive and will not be released to the public. Any individual (including non-U.S. citizens), corporation or association, public interest group, and local, state or foreign government, can request SDWIS/FED information under FOIA

(http://www.epa.gov/safewater/foia.html). Multidimensional aggregated data on water systems and violations is also available through MS Excel PivotTables® at http://www.epa.gov/safewater/data/pivottables.html..

T3Q3 Are the descriptions of the study or survey design clear, complete and sufficient to enable the study or survey to be reproduced?

Yes. These data are the reported system compliance and inventory results from all primacy agencies.

T3Q4 To what extent are the procedures for quality assurance and quality control of the data documented and accessible?

The procedures are documented in the Drinking Water Data Reliability Analysis and Action Plan (2003): http://www.epa.gov/safewater/data/pdfs/reports_draap_final_2003.pdf.

T4Q1 Have appropriate statistical methods been used to generalize or portray data beyond the time or spatial locations where measurements were made (e.g., statistical survey inference, no generalization is possible)?

N/A. This indicator does not portray data beyond the time and spatial locations where measurements were made.

T4Q2 Are uncertainty measurements or estimates available for the indicator and/or the underlying data set?

No. Recent state data verification and other quality assurance analyses indicate that the most significant data quality problem is under-reporting of monitoring and health-based violations and inventory characteristics. The most significant under-reporting occurs in monitoring violations. Even though those are not covered in the health-based violation category, which is covered by the indicator, failures to monitor could mask treatment technique and MCL violations. Under-reporting of violations could result in the estimates of population served being either high or low.

T4Q3 Do the uncertainty and variability impact the conclusions that can be inferred from the data and the utility of the indicator?

Routine data quality assurance and quality control analyses of the Safe Drinking Water Information System (SDWIS) by EPA have revealed a degree of non-reporting of monitoring and reporting requirements (discussed in T4Q2, above). As a result of these data quality problems, the baseline statistic of national compliance with health-based drinking water standards likely is lower than previously reported. Currently, SDWIS serves as the best source of national information.

T4Q4 Are there limitations, or gaps in the data that may mislead a user about fundamental trends in the indicator over space or time period for which data are available?

While the accuracy of violations data reported to EPA continues to be very good, the data are highly incomplete, particularly for monitoring and reporting violations. Under-reporting and late reporting of water system violations data by states to EPA affect the ability to accurately report the quality of our nation's drinking water. EPA last quantified the quality of violations data in 2004 for the period 1999 to 2001. Based on this analysis, the agency estimated that 65% of the violations data that States report were complete and accurate. Failures to monitor could mask treatment technique and MCL violations. Such under-reporting of violations limits EPA's ability to: 1) accurately portray the amount of people affected by health-based violations, 2) undertake geo-spatial analysis, 3) integrate and share data with other systems, and 4) precisely quantify the population served by systems which are meeting the health-based standards. Therefore, the estimates of population served could by high or low. Also, the percentage of the population served by systems that have at least one health-based violation is very small (e.g., 24 million in 2003), and heavily influenced by four systems that together served more than 10 million customers in 2003, including one, the New York City – Croton Reservoir system (serving 6.6 million customers) that reports a Treatment Technique violation because it does not yet filter its water, as required by the Surface Water Treatment Rule, even though it hasn't measured an exceedance of an MCL or another TT.